New National Leadership for Ocean Exploration

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Recent advances in technology promise a new great age of ocean exploration. Explorers can now reach deeper, see more clearly, record more accurately, and share data more widely than ever before. The oceans are changing. Nevertheless, the leadership and resources for ocean exploration seem inadequate. Can the national program for ocean exploration rise to the occasion?

Life on earth depends on ocean systems. Oceans are the earth's greatest absorber of carbon dioxide and reservoir of biological resources. They are a critical monitor of climate change. In 2015 sea surface temperatures and upper ocean heat content were the highest on record. Global sea level has risen by about 0.15 inch per year over the past two decades. We must understand the oceans to foresee our future.

The United States relies on structures for leadership and resources that were designed for the 20th century industrial age, not for the 21st century knowledge economy. New circumstances require new responses. Despite the advances in technology, some increase in government resources, activity by the private sector, and public support, the gap between the information we have and the knowledge we seek grows wider. Meanwhile, our government has a growing responsibility to cooperate on the high seas with other nations and to detect warning signals that the oceans are changing and that food stocks may be sick and dying. The National Oceanic and Atmospheric Administration (NOAA) has recently stated its mission is "to understand and predict changes in the Earth's environment, from the depths of the ocean to the surface of the sun, and to conserve and manage our coastal and marine resources." Its efforts, particularly on the high seas, may fall short.

The Age of Exploration

Five centuries ago changes in technology, in how states were organized, and in the purposes for which sovereigns used their power launched the golden age of ocean exploration. Technical advances in shipbuilding and navigation enabled European seafarers for the first time to sail long distances in stormy, distant, unknown seas. They collected information on their voyages to produce the first coherent maps of the world, an essential basis for making further discoveries.

New nation-states, first in Portugal and Spain, gathered together the resources to underwrite voyages of exploration. These states wanted to expand trade with Asia, to lay claim to new territories, and to settle scientific disputes such as the shape of the earth. Sovereigns hired seafaring captains to sail the high seas and to establish dominion over the lands they discovered. The new nation-states controlled these campaigns of exploration and conducted them in a spirit of rivalry.

Soon sovereigns gave charters to private corporations, backed by private capital. For example the Dutch East India Company then planted the Dutch flag in Cape Town and along the straits of Malacca and in the Spice Islands. These corporations sought profit by controlling the sources of colonial products and trading routes.

This free-for-all approach to ocean exploration gradually produced the rules that became the traditional law of the sea. European states claimed sovereignty over lands they discovered, usually based on the establishment of a trading post. In time these claims extended over the hinterland, and eventually out to twelve miles at sea, the maximum distance of a cannon shot. States gained power and wealth by sponsoring campaigns of ocean exploration. Success in the great age of exploration depended on advances in technology, the new organizations of nation states and chartered corporations, and national leadership determined to seek power and fortune through ocean exploration.

Last Century

The 20th century changed this system. One state or another had already claimed every speck of land in the oceans. Satellites mapped land features with full global coverage and almost absolute accuracy. New technology, including sonar, made it practical to gather information from the deep ocean. The main economic incentive for ocean exploration was no longer to develop trade routes; energy companies took the lead in seeking knowledge of the ocean floor and the resources that might lie beneath it, especially in offshore areas. States still engaged in ocean exploration to extend sovereignty in Exclusive Economic Zones (EEZ), a traditional path to wealth and power, but they focused less on land features and more on the ocean floor, ocean energy, and ocean resources. Now, as NOAA's mission statement recognizes, ocean exploration has a critical role to play in gathering information to understand the Earth's ocean environment and to predict change, especially to assist in conservation and management of coastal and marine resources.

The Law of the Sea Treaty, with almost universal adherence by states, established a complicated system for determining sovereignty in the oceans. In addition to the twelve-mile limit for sovereignty, states can demarcate areas up to a 200-mile limit, with adjustments for underwater geological features, within which they have exclusive economic rights. The ocean beyond that line, the high seas, is the common heritage of mankind. This system gives states a stronger incentive to explore the seas near their coasts, to the limit of their exclusive economic zones, where they can gain tangible benefits, rather than the high seas beyond their exclusive control. NOAA concentrates its efforts at ocean exploration largely within the U.S. exclusive economic zones. To better understand dynamic ocean processes the U.S. Navy, to meet military requirements, and the National Science Foundation, for research purposes, conduct surveys and expeditions on the high seas around the globe.

The Law of the Sea Treaty does not regulate ocean exploration on the high seas. Here explorers face three great problems that can be addressed with strong leadership and better organization. First, the work is more technically challenging because the area to be covered is farther from port facilities, usually in deeper waters, and more difficult for operational logistics. Fewer parties operate effectively in such waters. Second, the area to be explored is simply so vast that an immediate goal of full characterization and monitoring is impractical. Choices must be made. Third, because no single state has sovereignty or exclusive economic rights, states have less incentive to act individually. No standing international organization has a mandate to regulate or organize collective action on the high seas.

For some areas designated as a common heritage of mankind, groups of states have created special regimes. At the conclusion of the 1957-8 International Geophysical Year, acting on an earlier proposal by President Eisenhower, twelve nations (Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, United Kingdom, and United States) signed a treaty declaring the Antarctic the common heritage of mankind. All land area and ice shelves below 60 degrees southern latitude, but not the surrounding seas, are now recognized as common heritage areas where no claims to sovereignty are recognized; and, data from exploration should be shared. The Treaty now has 53 members, and they hold annual consultative meetings.

In contrast, the special regime for the Arctic accepts the general system for determining sovereignty, including the right to exclusive economic zones. The Arctic Council has eight members (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States). Despite political rivalries dividing these states, the council has pursued its technical work without interruption. Several other states, including China, and

representatives of indigenous peoples living in the Arctic participate as observers. The Council estimates that because of global warming by 2050 it is likely that in summer Arctic navigation routes will be ice-free.

As the Arctic ice melts, opening up the ocean for exploration and trade, the danger of clashes over sovereignty increases. The State Department leads U.S. participation in the Arctic Council.

International Initiatives

In the absence of a comprehensive regime for governance of the high seas, interested states and research institutions collaborate through technical organizations. One example is the General Bathymetric Chart of the Oceans (GEBCO). Launched a century ago, on the suggestion of Prince Albert of Monaco, it provides authoritative, publicly available data sets for the world's oceans. Information generated by NOAA and the U.S. Navy features prominently on its website.

The ARGO array, another collaborative regime, provides 120,000 inputs of temperature, salinity, and depth profiles per annum. This system of 3,500 drifting floats in the upper ocean is managed by 50 nations, but the United States provides fully half of the drifting floats. NOAA funds U.S. participation, which is in turn implemented by five independent research institutes. A main goal of ARGO is to measure the total global heat storage in the ocean. The Global Ocean Acidification Observing Network (also with strong NOAA support) provides a comparable function.

The Regional Fisheries Management Organizations provide another example of ad hoc collaboration on the high seas. These international regimes establish rules for fishing both in exclusive economic zones and on high seas, because often fish stocks straddle both areas. These seventeen organizations set limits that are binding on their members for sustainable fishing of specified species, but they lack enforcement provisions, relying only on the good will of their members.

However, an international ad hoc structure can include enforcement provisions. In response to rising rates of piracy in the seas off the coast of Somalia, a consortium of states set up an elaborate "neighborhood watch" system involving naval assets from EU and NATO countries, as well as from other countries. Major shipping companies cooperated, and increased the ability of their vessels to repel pirates. Kenya agreed to prosecute captured pirates for crimes on the high seas. In turn the UN Security Council provided legitimacy for this ad hoc enforcement mechanism in a resolution.

The tendency of states is to create ad hoc technical regimes, rather than a universal treaty organization, to facilitate cooperation on the high seas. Within this context U.S. national leadership for ocean exploration must be able to bring together exploration resources from the public and private sectors and to set priorities and manage collaboration with international partners.

U.S. Ocean Explorers

U.S. national leadership on ocean exploration must be able to marshal resources to operate in both coastal areas and on the high seas, to secure from the community of U.S. ocean explorers agreement on priority tasks and areas, and to coordinate on the high seas with international partners, which often have differing views on ultimate objectives, on design of campaigns, and on data sharing.

Within the U.S. exclusive economic zones NOAA provides such leadership through its administration of the U.S. Integrated Ocean Observing System. This organization, established with a Congressional mandate, aims to create "an integrated system that serves global needs {that depend} on cooperation, clear data standards, shared data, and the development and maintenance of projects and technology." NOAA has the task to provide national leadership to join together potential investments by 17 federal agencies to establish a network of people, technology, and data within 11 regional systems, but it has neither legal authority over other federal agencies nor control over their funding. A primary goal of this organization is to help understand and forecast changes in our ocean and climate. Its greatest success is to provide routine reliable ocean information upon which regional and local decision makers can rely. While each of the eleven regional systems has its own list of projects, many share several features, such as collection of data on ocean salinity, temperature, hypoxia, acidification, and ocean surface conditions for search and rescue support. In June 2016 NOAA announced $31 million in grants to these organizations for the five years ahead. Although NOAA considers "exploration" (i.e. the initial characterization of information from previously uncharacterized areas) to be a separate activity from "observation" (i.e. a repeated characterization of information from the same areas), the resources, technology, and purposes today are substantially identical. Perhaps similar networks, formed by potential partners with interests in defined areas of the high seas, would be useful vehicles for NOAA leadership of ocean exploration.

Today within the United States there is an extensive community of governmental and academic partners for ocean exploration. Players include, but are not limited to, the United States Navy, the National Oceanic and Atmospheric Administration (divided into

various subparts), the National Science Foundation, the Department of the Interior, the National Aeronautical and Space Administration, state and regional agencies, private research institutes, and universities. Each player designs its own program, including goals for research, grant giving, and ship utilization.

Although legislation assigned the task of national leadership in ocean exploration to NOAA and blue ribbon panels have recommended significantly increased funding for this task, help does not seem to be on the way. NOAA's ocean exploration team is in fact a minor player in terms of staff, financing, and operational resources. Each year NOAA requests only a fraction of the funding levels recommended, and Congress then appropriates funds at a marginally higher level. Is there a path by which this cycle might be ended so that the national leadership for ocean exploration benefits from recognition of its government-wide responsibilities and adequate funding?

To Go Beyond Business as Usual

An answer can be sought by addressing three questions.

First, to strengthen national leadership for ocean exploration we need clear purpose. That purpose must reflect the circumstances of the 21st century, particularly the rising fears about climate variability. That purpose must be stated in language that speaks directly to public opinion and to Congressional appropriators. That definition should avoid technical jargon, including the artificial distinction between characterizing something for the first time (exploration) or the second time (observation), as both data sets are needed to understand climate change.

In the great age of exploration a series of explorers attempted to find the Northwest Passage, in the process discovering many things they were not looking for, including the site of this year's national forum. Throughout history exploration has occurred in successive waves, each building on the work of previous explorers, providing information for further discoveries and improved understanding. Today's explorers must not be limited to initial characterization.

Second, should the juridical concepts that divide the oceans into areas under exclusive jurisdiction of states, exclusive economic zones, and high seas, determine how the United States organizes its national leadership for ocean exploration? After all, geological features extend from one area to another; fish stocks straddle both; and, ocean currents flow without regard to jurisdictional lines. Climate change has impacts across the entire ocean world, albeit in different ways. To provide national leadership NOAA maintains

one unit for ocean exploration (characterizing previously unmeasured areas primarily in the EEZ but also on the high seas) and another for ocean observation (conducting long time series measurements of key parameters only within the EEZ. and a second unit responsible. This arrangement disperses rather than concentrates leadership. The natural alternative would be one strengthened organization within NOAA responsible for ocean exploration and observation, as defined, wherever. A unified organization would still have to contend with the complications of multiple, unrelated international regimes, but it could avoid unnecessary bureaucratic duplication in Washington.

By eliminating the bureaucratic distinction between initial characterization and subsequent characterizations or observations, a clearer statement of purpose becomes possible, perhaps along the following lines: *Ocean exploration is the act of going to sea to gather information about the ocean, including the ocean floor, the water column and the resources within them. The purpose of ocean exploration is to make this information publicly available as a basis for scientific discovery and better understanding of the world we live in and how it may be changing.*

Third, should national leadership for ocean exploration remain within NOAA? After all, NOAA has less technical capacity and devotes fewer operational resources to this task than the U.S. Navy; it has less funding for what it characterizes as ocean exploration than the National Science Foundation; and, its annual funding requests to Congress for ocean exploration indicate a disinclination to expand its activities in this field. The vast majority of the nation's ocean explorers and researchers work for independent institutions, academic research centers, and in private industry. Might there be a changed formula for federal government leadership that could better draw together national resources for ocean exploration?

Criterion for success in providing national leadership should include, at a minimum:

--prominence in agenda-setting for ocean exploration, which would improve coordination of limited assets (such as ocean capable ships) needed to sustain an active program.
--more resources for NOAA led ocean exploration campaigns, whether from federal appropriations, charitable contributions in funds or in kind, or from collaboration by corporations and research institutions.
--an ability to be actively involved in, and often to lead, U.S. participation in the growing network of international regimes active in coordinating ocean exploration on the high seas.
--flexibility that allows NOAA to concentrate on technical areas where it may have a substantial advantage, for example such areas as fly-away instrument packages for use on non-NOAA vessels, tele-presence, and data-sharing.

Three Options

The next Administration should examine three separate options for solving this problem. The first would be consolidating NOAA support for ocean exploration and observation and securing funding levels that would justify NOAA's having the lead within the executive branch. The second option would be to consolidate the role of national leadership within the President's office by making this a specific function of the President's science adviser, similar to what President Obama has done regarding Arctic affairs. Neither of these options would give a seat for players outside of the executive branch to participate directly in national leadership for ocean exploration.

The third and more radical, but very attractive option would be to move the responsibility for national leadership elsewhere. In the past Congress has established institutions with comparable responsibilities when national leadership required more flexibility and collaboration with private institutions than is common for cabinet departments. In 1984 Congress mandated the National Fish and Wildlife Foundation "to protect and restore fish and wildlife and their habitats." The Foundation's programs involve fifteen federal agencies, non-governmental organizations, corporations and individuals. It finances its work by combining federal funding with private donations. It is a private corporation established under federal law, and a 501 © 3 public charity under the tax code. Its current $3 billion annual funding is predominantly from federal sources, but more than one quarter comes from gifts. The Secretary of the Interior appoints the thirty members of its board; in addition its Stewardship Council includes corporate membership. This governing structure has enabled the Foundation to operate with a flexibility that would be difficult to achieve within a cabinet department, and to secure not only additional funding from private sources but cooperation from the private sector in implementing specific programs. Recently it has played a critical role in implementing projects funded by the settlement of claims arising from the 2010 BP oil spill in the Gulf of Mexico. The Foundation's quasi-independent character and flexible mandate have been important in its success.

Also in 1984, acting on a proposal from an independent commission, Congress established The United States Institute of Peace "to increase the nation's capacity to manage international conflict without violence." The commission's report cited the need for federal leadership in this field that would strengthen the work being done by other actors. USIP's board includes statutory members, such as the Secretaries of State and Defense, President of the National Defense University, and private citizens who are nominated by the President and subject to confirmation by the Senate. The Institute also has an advisory panel composed of eminent persons. While Congress appropriates the

core funding for the Institute, it can accept funding transfers from other federal agencies; it was authorized to accept private donations only to build its current headquarters building and to defray hospitality expenses. From modest beginnings USIP has become a leading think-tank and an important vehicle for strengthening civil society groups, both in the United States and abroad, to resolve conflicts peacefully. Its role has been particularly critical in reaching out to non-state actors, a task often difficult for the State Department or USAID to perform. It provides leadership as a convener and supporter of the best research from both practitioners and scholars. Today it has become difficult to imagine the foreign policy landscape of Washington without a prominent role for USIP.

However the next Administration opts to organize national leadership for ocean exploration, it faces two parallel challenges: how to organize leadership within the federal government and second how to provide leadership that involves all players --public and private-- for a truly national effort. In this century delegated authorities may be less significant for success than networking ability. Given public concern over climate change, in the oceans as well as on land, it is time to rethink the status quo.